Building for the Future, Together

A Model for Bringing Emerging Products to Market, Using Anticipatory Ethnography and Mixed Methods Research

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Applied ethnography practitioners are often charged with learning from existing or potential customers, for a product that is either familiar to them or close in nature to what they have used before. There are particular challenges for emerging technologies, where the market is much less defined. Applied ethnography has the potential to help with predicting future market scenarios, honing the value proposition and product definition. Done well, these contributions help align siloed teams, resulting in better products being delivered to the right customers, faster. This case study will outline the approaches used across all product development stages for new creative design tools in the emerging field of immersive media – specifically, 3D and Augmented Reality. A collaboration model and best practices are offered, to guide practitioners to address both overt challenges (e.g., identifying which audiences to focus on), and hidden challenges (e.g., creating a human-centered dialogue in an ambiguous, technology-centered space).

INTRODUCTION

Immersive Media: An Emerging Technology

A technology can be considered "emerging" when it causes a "radical change to business, industry, or society" (Halaweh 2003, 110). Because its primary impact occurs in the future, an emerging technology is marked by ambiguity (Rotolo Hicks and Martin 2015), as well as uncertainty around return on investment and penetration rate (Halaweh 2003). This technology does not need to be a new invention - it can also be a re-application of an existing technology in a new domain (Adner and Leventhal 2002). Companies that build emerging technology products face a unique challenge, namely that by definition, the market for these products is largely undefined.

Immersive media, defined here as being composed of 3D and augmented reality (AR), is one example of emerging technologies. 3D is defined as computer generated imagery (Figure 1), and AR is defined as virtual content overlaid upon a "real" environment (Milgram et al. 1994; see Figure 2). It's notable that 3D is not a new medium - it has existed for decades, especially within video gaming and visual effects industries. Historically, most software tools for creating 3D content have been associated with a steep learning curve, related to 3D tools' overwhelming user interfaces (Gustavsson 2014) and challenges manipulating and controlling 3D content on a 2D screen (Chen, Mountford, and Sellen 1988). Consequently, their use was often limited to users with in-depth 3D domain specialization.

Figure 1. A living room "render", composed entirely of computer-generated 3D content. The room includes, from left to right, a small plant, a gold lamp, a small wooden table, a blue sofa, a blue painting, two gold lamps hanging from the ceiling, and another tall lamp. This image demonstrates how 3D can be used in lieu of a photoshoot. Vadim Andrushchenko - stock.adobe.com.

     3D is an emerging technology within the context of its recent growth into new domains - namely, markets such as e-commerce. For instance, in 2014, 75% of the IKEA store catalogue consisted of computer-generated 3D imagery (Wilson 2014). 3D content creation is highly versatile, with the ability to quickly be edited or deployed at scale, saving time and resources associated with traditional mediums like product photography. As such, many creators who previously avoided working with 3D software are breaking into the medium. Software companies are taking note of this shift, creating more accessible 3D tools. Blender, for instance, is an open-source, free 3D application, which underwent a major UI/UX update in 2018, making the tool more accessible (Blender 2018). In a 2020 survey of 4100 designers, UX Tools found that the broader design community is developing an interest in 3D tools, adopting 3D software including Blender (Bowman and Palmer 2020).

Figure 2. Using AR technology, a woman places new furniture on a digital tablet, overlaid onto an empty interior via the tablet's camera. In this way, AR could be used for designing an environment, or for a consumer use cases, examining how furniture looks before purchasing it. rh2010 – stock.adobe.com.

AR is a more recent medium as compared to 3D and can be consumed on a mobile device or in a headset. An AR experience often, but not exclusively, consists of 3D content. As of 2019, there were 334 active AR users across the world, with that number expected to grow to 1.076 billion by 2023 (Boland 2019). The nascent AR medium started to gain significant traction in 2017, when Apple and Google released their software development kits (SDKs) for AR Kit and AR Core, respectively, enabling developers to create AR experiences more easily for new iPhones and Android devices. However, working with an SDK requires coding experience. Individuals who could not write code, but were interested in creating AR experiences, would still face a barrier to entry. This barrier presented an opportunity for companies seeking to build AR creative design tools that do not require any coding experience.

One important characteristic of the immersive media products is that their design tends to be technology-driven, rather than user centered (Evans and Koepfler 2018). That is, product development in this space is often steered by the type of available technology, rather than the type of human experiences one seeks to create. The consequence of a technology-driven approach can include creating tools that no user wants or needs, or at worst, tools that lead to negative experiences for the user. For example, there is evidence that in a conversation between a person wearing an AR headset and a person not wearing such a headset, the latter person will report less social connection to their partner (Miller et al. 2019). In a more extreme example, Faccio and McConnell (2017) reported a disproportionate increase in vehicle crashes, and related damage, injuries, and fatalities within one United States county where users could play the AR game, Pokémon GO, while driving. The authors estimated the incremental county-wide cost of this AR game play while driving was between $5.2 to $25.5 million over the 148 days following the introduction of Pokémon GO. A goal of those creating immersive media must be the consideration of how we can create positive human experiences, both for the target end user and those who may inadvertently be included in immersive media technology experiences.

Business Context

Immersive media's rapid growth presents a significant business opportunity for companies developing creative software. One such company is Adobe Inc, a multinational software corporation that builds creative design tools. In 2017, Adobe launched the first version of Adobe Dimension, a 3D design application targeting 2D designers that emphasized ease of use. In the same year, Adobe began development on what would become Adobe Aero, the company's first AR design tool. In 2019, Adobe would go on to acquire two major leaders in 3D creation software, Allegorithmic and Medium. In 2021, Adobe announced its Adobe 3D Substance Collection, including five 3D applications to span an end-to-end 3D creative workflow.

Adobe's expansion into the immersive media space presented two challenges:

1. **Overt challenge:** identifying which audiences to focus on and defining how and why they might create immersive media experiences.
2. **Hidden challenge:** creating a human-centered dialogue in an ambiguous, technology-centered space. This was a hidden challenge for two reasons:
   a. First, many of the immersive media product teams had a culture rooted in solving difficult technical problems. Engineering innovation, rather than the user experience, was typically the focal point. Applying a human-centered, research-based approach to product development was new to many team members. This meant that it would be both challenging and vital to demonstrate the value of applied ethnography, in order to facilitate a more human-centered culture. This was not readily observable until collaborating with the teams, and therefore "hidden".
   b. Second, unlike conducting qualitative or quantitative studies, fostering team alignment by centering teams around customers is not always an obvious part of a research practitioner's role. It is therefore "hidden".

Applied ethnography was well-situated to address these challenges, because practitioners can identify non-obvious human goals, motivations, and unmet needs, which can be predictive of future behavior. In addition, bringing this human-centered focus to product development has the potential to form alignment around siloed teams, with customers becoming a common reference point. This case study will outline the framework used across all stages of product development for new creative design tools in the emerging field of immersive media. The applied ethnography practitioner for this case study was a design researcher (the author) embedded within product teams.

RESEARCH APPROACH

Addressing the overt challenge was a process that unfolded over two phases. Phase I included defining the target end users and use cases for Adobe Aero and applying anticipatory ethnography to validate user profiles and features. Phase II occurred following the acquisition of Allegorithmic and Medium, where Adobe sought to define a go-to-market strategy for its expanded presence in the 3D space.

Phase I

Phase I included generative research, using methods commonly associated with mixed-methods user experience research (Table 1). The business questions being addressed were, "Whom do we build for first?" and "What do we start building?"

Table 1. Mixed-methods approaches for identifying target end users and feature set for Adobe Aero.

Research Approach	Goal	Deliverable
Literature review	To identify dominant AR use cases and the problems AR is uniquely solving. Included internal and external market research, academic research, and internal stakeholder interviews.	Report with recommendations, including main use cases and problems solved by AR.
In-depth interviews	To identify goals, motivations, workflows, and pain points of current AR creators, as well as creatives with no AR background, who were interested in creating AR experiences.	Audience attribute ranges (e.g., 3D experience level) with Adobe opportunity areas mapped onto these ranges; workflow and collaboration models.
Survey	To measure how many customers were already engaging in use cases that AR could help solve, such as environment design.	Research report including the percentage of respondents currently engaged in environment design activities, and a breakdown of activity types. Recommendations for pursuing an environmental design audience (e.g., AR use cases for this audience) were also included in the report.

Data from these three approaches were combined to inform Adobe Aero's personas, with a focus on details relevant to product design, such as attributes, behaviors, and unmet needs (Harley 2015). These personas remain in-use by the product team as of the time of writing. The findings also revealed that to meet users where they were at, the team would need to support importing options for content types that were familiar to users (e.g., 2D Photoshop layers), and allow users to build interactive narratives without code.

The main recommendation that emerged from this mixed-methods approach is to begin primary research for emerging technologies by observing and interviewing "lead" users, namely those who are early adopters of a new technology. This "lead user strategy" is one application of an "extreme user strategy", in which people who are extreme in some way are studied, in order to reveal less obvious behaviors or needs that are present in more "typical" users (Goodman, Kuniavsky, and Moed 2012, 220; von Hippel 1986). Studying lead users often yields a wide range of new design opportunities, whereas the typical user strategy is well-suited to solving a specific problem, after the target audience has been specified (Goodman, Kuniavsky, and Moed 2012).

Collectively, this generative research was a springboard for the product team to start development on early software builds of Adobe Aero. At this stage of product development, the team faced a challenge - namely, how to understand what users would value in this emerging AR technology, given that they may have never experienced AR, or had any prior knowledge about the medium. At this point, the design researcher employed **anticipatory ethnography**, in which a **design fiction** was presented to potential customers, and they were observed interacting with that fiction (Lindley, Sharma, and Potts 2014).

Anticipatory ethnography is a practice that traces its roots to speculative design, which focuses on designing for how the world *could* be, asking questions, finding problems, and designing for the future (Dunne and Raby 2013). Speculative design can be contrasted with traditional design, which designs for how the world is at present, answering questions, solving problems, and designing for production (Dunne and Raby 2013). Design fiction is a speculative design approach, in which one designs with stories, or "within the world of a story" (Lindley, Sharma, and Potts 2014, 241). Science-fiction writer Bruce Sterling defined a design fiction as "the deliberate use of diagetic prototypes to suspend disbelief about change" (Bosch, 2012).

Lindley, Sharma, and Potts (2014) proposed thinking of a design fiction prototype as a painting, comprised of three parts. Each part corresponds to three approaches to anticipatory ethnography: the ethnography of the paint, brushes, and creating the painting (i.e., studying the design fiction creation process), ethnography of the actual painting (i.e., studying the design fiction content), and ethnography of the audience viewing the painting (i.e., "studying how an audience interacts with or perceives a design fiction", 246). This third part was applied in the current case study, in which potential customers interacted with a design fiction, participating in the fiction through a prompt provided by the researcher.

Inspired by human-centered emerging technology research methods outlined by Hyer, Herrmann, and Kelly (2017), the design researcher and the lead designer on Adobe Aero defined a research objective: identify how participants, who aligned with the Aero personas formed from earlier research, sought to augment their reality, and by extension, the value - if any - they saw in an AR creation app. The materials for this research included an acrylic sheet, three printed photos of scenes that one may typically encounter in day-to-day life (an empty apartment, a busy street, a room in a museum), and three markers of different colors. 13 participants were recruited for in-person research sessions with a moderator (the author) and an observer. Participants were all creative professionals, who aligned with the characteristics outlined in the Adobe Aero personas. Following an in-depth interview about their background and current creative practices, each participant was shown the three printed photos, one at a time. Presentation order of the photos was randomly counterbalanced, to prevent order effects (e.g., Elmes Kantowitz Roediger 1999). For each

photo, the participant was provided with the prompt, "How would you make this ordinary scene extraordinary?"

Two clear patterns emerged across the interviews. First, participants whose design practice focused on environment design depicted static objects and focused on precise layout and measurement of objects in an environment. Second, participants whose design practice focused on UI/UX design included numerous interactive elements. Figures 3 and 4 depict an example of what participants from each group drew.

Figure 3. This image depicts how a participant with environmental design experience made their "ordinary scene extraordinary", depicting their ideal space design layout in an otherwise empty apartment. The participant accomplished this by using three different colors of markers to draw furniture and fixtures on an acrylic sheet, placed on top of a printed image of an empty apartment.

Figure 4. This image depicts how a participant with a background in UI/UX design made the "ordinary scene extraordinary", depicting an outer space scene floating in the middle of the room, emitting sounds and including objects orbiting around one another. The participant accomplished this by using three different colors of markers to draw planets, a spaceship, and soundwaves on an acrylic sheet, placed on top of a printed image of an empty apartment.

This prompt helped transport the participants into an alternate reality where anything was possible, simultaneously revealing what they sought to create in an AR application, and if and how an AR app could bring them value. Notably, as participants drew on the acrylic sheet, they started to build a narrative around the scene, such as how they got there, and whom they would invite into this virtual world. Without this approach, it would have been difficult to gauge what participants would value in an emerging technology they were unfamiliar with, and for which no product prototype yet existed. These insights and recommendations from this study led to specific features being developed for the application, such as a system for building interactive experiences (e.g., being able to support audio files, and add content and have it orbit around a target - both of which would be necessary to actualize the outer space scene in Figure 4).

Though this primary research directly informed Adobe Aero's product development, such as prioritization of features for authoring interactive experiences without code, a challenge persisted. Given that AR was a nascent, emerging medium, it was commonplace for the team to question if and how target end users, and consequently, product development, would change as the medium evolved. This challenge presented an opportunity to more directly connect product team members with customers, beyond observing research sessions and attending research readout presentations. One option in this scenario might be to teach the product team to conduct primary research themselves. However, at this stage of product development, the team did not have the bandwidth in their product development cycles. The design researcher therefore sought new methods to

engage the product team in developing a human-centric lens, that could fit into their day-to-day activities.

The first example of such a method was the adaptation of coding open-ended survey responses (e.g., Sproull 1988) into a team activity. The design researcher assembled a **rubric to code 1730 open-ended responses to a beta program intake survey,** regarding why applicants were interested in gaining access to Aero. The rubric allowed responses to be classified into four core categories. These categories were accompanied by role and self-reported AR experience level. Stakeholders from across different functions (product, design, engineering) were invited to a data coding session over lunch, where they were provided instructions, orientation, and approximately 200 rows of randomly sampled open-ended responses per person. During the session, team members could ask clarifying questions in real-time, and discuss their learnings with the group. Following completion of the session, the practitioner rated a subset of the original responses without referencing the groups' coding and calculated inter-rater reliability (Hallgren 2012). The most frequently occurring use cases were then graphed and shared with the team. This exercise not only helped efficiently code a large number of open-ended responses - it also brought the product team into direct contact with customer responses, so that they could learn first-hand about the type of use cases participants were interested in building.

In a second example, the design researcher created an **observation framework** for the Aero product team bound for Adobe MAX, Adobe's annual conference. At MAX, about 15,000 attendees attend talks, workshops, and exhibits by Adobe product teams (Ellett 2019). The product team would be staffing an Adobe Aero booth, where they would have the opportunity to interact with thousands of customers over the course of several days, including observing and speaking with customers as they used Adobe Aero.

The observation framework prompts shared in advance with the product team included:

- "What surprised you [during a customer observation or interaction]?"
- "What is this person's role?"
- "What worked well for the customer?"
- "What challenges did the customer face?"
- "What use cases did you hear?"

These prompts were accompanied by humorous memes to help make them more memorable. At MAX, product team members had access to daily electronic forms, where each member could document their notes per prompt. Immediately following the conference, the design researcher moderated a group debrief session, where each team member could share and elaborate on their observations per prompt. The design researcher, documenting these observations, then engaged in affinity mapping with the team to discover common themes. This observation framework helped the team develop the ability to intentionally interact with customers, gaining an intuition about different user profiles and more generally, fostering a human-centered way of thinking about product development as part of their existing job responsibilities.

Phase II

Phase II takes place following Adobe's acquisition of Allegorithmic and Medium. Adobe was seeking to build its go-to-market strategy for what would become the Adobe 3D Substance Collection, launched on June 23, 2021. At the time of the acquisition, the design researcher had conducted 21 user research studies on current and potential immersive media users, both qualitative and quantitative. This meant that there was a wealth of research about immersive media user goals, motivations, unmet needs, workflows, and creative tooling technology adoption behavior. However, none of these studies were specifically aimed at defining the go-to-market strategy.

The market research and pricing team reached out to the design researcher, with the aim of informing this strategy. It is important to note that these teams did not usually collaborate with the user research function at Adobe, and had limited exposure to applied ethnography practices. However, given the newness of this space, these teams sought any prior internal research that was available on immersive media. They had become aware of this research through communications with product teams, who were already connected to this work. In addition to learning about this past research, the market research and pricing teams were also seeking to identify target segments, and how these segments would value the newly acquired 3D software tools.

Throughout this collaboration, the design researcher ran several new qualitative studies where marketing and pricing stakeholders were primary stakeholders, and as such, provided a direct window into user profiles by observing research sessions, participating in debriefs, and research readouts. These studies consisted of in-depth interviews focusing on participants' current background, goals, motivations, workflows, and technology adoption habits, as well as concept testing new 3D software capabilities. This research informed the go-to-market strategy for freelancers, small-to-medium-sized businesses, and enterprise customers for the Adobe 3D Substance Collection launch.

One culminating project from Phase II was the construction of a 3D and AR **user taxonomy** by the author. This taxonomy was built by synthesizing findings across multiple sources, such as internal primary research, internal stakeholder interviews to document institutional knowledge, secondary market research, and a workshop where cross-functional participants across product, design, engineering, marketing, and sales shared real-world examples of users, including their goals, motivations, and software use. Through affinity mapping information across the aforementioned sources, the design researcher identified a core set of user profiles that might interact with immersive media products. Subject matter experts, such as design and product leads, provided iterative feedback on the specifics of the taxonomy. The taxonomy was intentionally product agnostic. That is, there were no "Aero users" or "Dimension users" described. Instead, profiles of roles such as the "3D artist" and "interaction designer" emerged, including user goals, differentiators, key use cases, workflows, design deliverables, and descriptions of 3D and AR experience levels. These detailed user profiles were organized under a smaller set of umbrella groups. Grouping was based upon similarities between user groups' mental models, creative goals, and the types of design deliverables they created.

The benefit of making the taxonomy product agnostic was that it refocused teams on a *holistic* picture of customers, rather than only as a user of a specific software application. For example, a given application might be used by several different user profiles, so referring to a

customer only as 'a user of application x or y' would not capture nuances that could affect adoption of other immersive media applications. Relatedly, a certain user profile might be interested in expanding their skills to include certain types of immersive media (e.g., interaction designer learning to build interactive AR experiences), but not others (e.g., creating 3D textures from scratch). This holistic focus was particularly relevant because Adobe was positioning itself to offer an ecosystem of immersive media tools. By "zooming out" to this holistic level, it was easier to identify go-to-market opportunity areas across the ecosystem, and differentiators that would lay the groundwork for the marketing team's user segmentation.

Ultimately, this taxonomy served as common ground not only to product teams and marketing, but also to a less obvious stakeholder - Adobe Research. Adobe Research is Adobe's advanced technology lab, focused on innovation and research and development. Due to the focus on innovation and technology, a common challenge that arose was that research scientists were often siloed from product teams, disconnected from customer profiles and needs. Removing this silo could benefit research scientists and the company - if a new algorithm or prototype can address a user need, this increases the probability of a successful technology transfer to a product team.

To foster systematic connection between Adobe Research Scientists and user research, the design researcher started a casual **"Salon Series"**, in which a small group of research scientists working on immersive media workflow-related technology gathered monthly with the design researcher and an immersive media product designer. The meetings would focus on discussing upcoming and recently completed research studies on immersive media, and sharing work from the broader user research team, such as about how creative professionals currently collaborate. This Salon Series fostered greater connections between customers' unmet needs, and the technology being developed in Adobe Research. It also resulted in two subsequent collaborations between the user research function and Adobe Research, and one project being considered for tech transfer into a 3D product.

BUSINESS IMPACT

Through a mixed-methods approach, including anticipatory ethnography, the research from Phase I and II addressed the **overt challenge** of identifying which audiences to focus on, and defining how and why they might create immersive media experiences, as well as the **hidden challenge** of creating a human-centered dialogue in an ambiguous, technology-centered space.

Specifically, Phase I directly informed target end user definition for Adobe Aero (i.e., Aero personas), as well as features that remain in the application today. These features include the ability to import both 2D (e.g., Photoshop layers) and 3D content from other Adobe applications, and the ability to build interactivity between digital objects without requiring code. Though not discussed here, it is noteworthy that subsequent iterative Adobe Aero prototype testing also yielded user journey maps that informed analytics instrumentation.

The qualitative work in Phase II, culminating in the 3D and AR user taxonomy, helped the marketing team gain insights about user profiles and technology adoption habits. Feedback from go-to-market concept testing revealed what customers valued in immersive media tools, which helped the marketing and sales team communicate the new 3D offering

to customers. This was accomplished by using human-centered language, and focusing on concepts that were most relevant to customers. This research also informed subsequent audience segmentation survey instruments, including measurement of self-reported 3D experience levels, immersive media creative activities and outputs, and lists of competitor tools.

The impact of the engagement between user research and Adobe Research can be summarized as providing a human-centered lens to Adobe Researchers; revealing opportunity areas for Adobe Researchers by providing clear examples of customer profiles and needs, and increasing probability of tech transfer by pursuing projects that align with customer needs.

COLLABORATION MODEL AND BEST PRACTICES

The research approach outlined in this case study can be distilled into a collaboration model that is extensible to other organizations, and in particular, those seeking to bring emerging technology products to market (Figure 5).
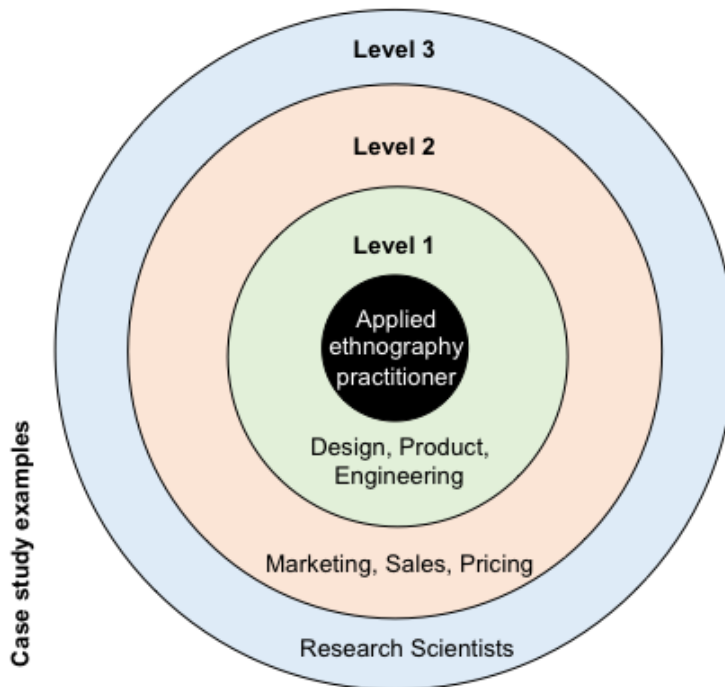

Figure 5. This image depicts a collaboration model for emerging technologies, centered around the applied ethnography practitioner. Three levels of stakeholders are then represented by concentric circles around the applied ethnography practitioner. Examples of each level, drawn from the current case study, are included in the lower half of the image. Level 1 includes design, product, and engineering. Level 2 includes marketing, sales, and pricing. Level 3 includes research scientists.

The applied ethnographic practitioner is situated at the center of the model. They can orchestrate collaboration across different partners, of various "distance" from the emerging technology product. In the present case study, level 1 consisted of designers, product managers, and engineers on product teams, such as the Adobe Aero team. Level 2 consisted of marketing, pricing, and sales teams, working to develop an immersive media go-to-market strategy. Level 3 includes less obvious partners. In the present case study, these partners were research scientists in advanced technology labs, often working siloed from product teams.

By increasing the number of "levels" of partners, the applied ethnography practitioner has the capability to align siloed teams around customers through research (i.e., a hidden challenge), in addition to addressing more conventional overt challenges. Foundational, product-agnostic artefacts can provide common ground for partners across all levels. In the present case study, this artefact was the 3D and AR user taxonomy.

Looking across Phase I and Phase II of the present case study, several **best practices** emerge for bringing emerging technology products to market:

1. **Start with "lead user" interviews:** Consider starting primary research on emerging technology products with qualitative approaches focused on "lead" participants (for example, early adopters who have experience working with an emerging technology), if they exist. This will allow the team to understand what early adopters value. From there, one can better understand if and how non-lead users may approach an emerging technology product. In the absence of lead users, one can look to analogous users or scenarios for inspiration (e.g., Doorley 2018). In the case of AR, this could involve observing and interviewing individuals who engage in designing spaces (e.g., architects, interior designers), to draw upon their goals, unmet needs, and workflows for AR product inspiration.

2. **Situate research participants in a future in which the emerging technology exists**, using prompts, prototypes, or other materials to understand what they value in that future (i.e., anticipatory ethnography; see Lindley, Sharma, and Potts, 2014 for the theoretical tenets behind this approach).

3. **To align teams, consider building product agnostic artefacts that can serve as common ground for multiple "levels" of partners.** Without product-specific personas, features, or UI/UX associated with user profiles, the applied ethnography practitioner can easily work across different teams. Each "level" of partner (see Figure 5) can apply a different lens. For example, a designer might be more interested in the mental models associated with each user profile, whereas a marketer might be more interested in how the user profiles map to market research segments. Additional research to meet the needs of each partner can then be pursued.

4. **Consider novel ways to actively engage teams in customer research, to foster a human-centered culture.** Emerging technology teams are faced with a great deal of ambiguity, which can lead to questioning target end users or even the core value proposition of the product. In addition to conducting primary research, an applied ethnography practitioner can extend their skills by adapting formal methods (e.g., qualitative coding of open-ended survey responses in this case study) to group activities that are accessible across the team. Another example of this approach was

creating an observation framework for team members, to be used when interacting with customers at an industry conference. This approach can help foster a human-centered culture across the team.

5. **Find allies in multiple "levels", who are interested in learning more about customers and their needs**. In the present case study, these allies included research scientists and marketing, pricing, and sales teams. Systematic engagement between the practitioner and these partners can be facilitated through means such as meeting series (e.g., the Salon Series in this case study), workshops, and observation of research sessions. By including multiple levels of stakeholders, the practitioner can break down silos by focusing partners on a common set of customer data.

CONCLUSION

This case study detailed a model of how anticipatory ethnography and mixed-methods design research can be applied across all phases of bringing emerging creative tools to market. The specific business impact of this model includes defining target audiences, use cases, product features, and go-to-market strategy. Equally important is the model's ability to align otherwise siloed teams around a human-centered approach, offering an alternative to the technology-first approach commonly associated with emerging technologies.

The following lessons are broadly applicable to the EPIC community:

- Examples of how applied ethnographic approaches (e.g., anticipatory ethnography) can be incorporated into a research program for bringing emerging tools to market.
- Examples of how human-centered research and activities were used to generate dialogue and bring together siloed teams.
- A collaboration model and collection of best practices for leading customer research for emerging technologies, both for formal research practice, as well as stakeholder alignment and customer engagement.

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